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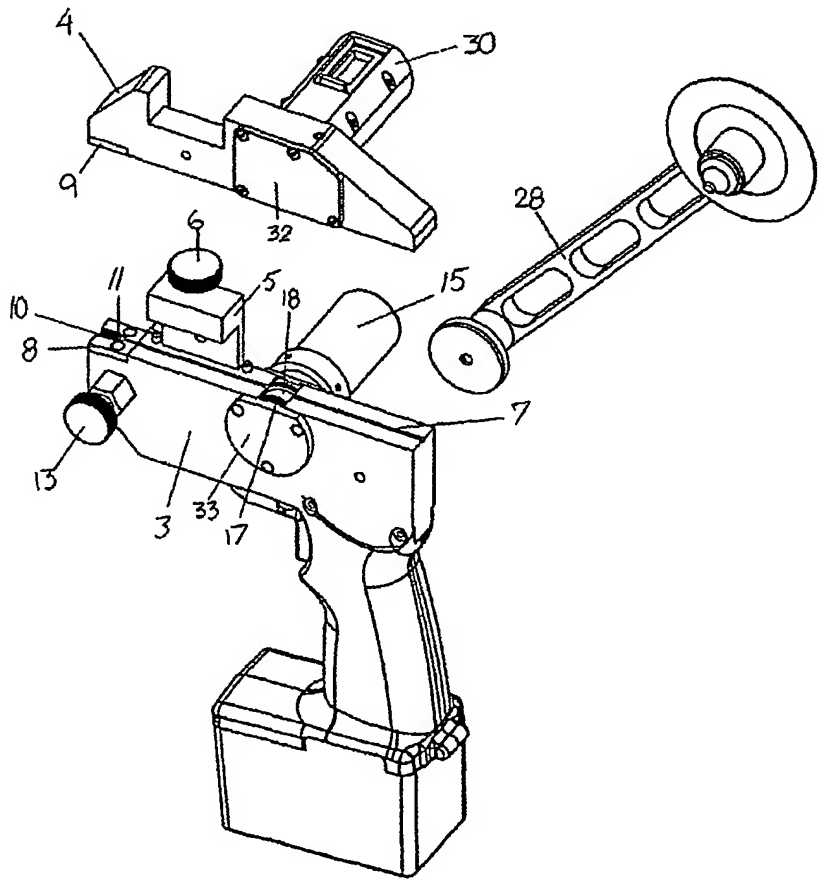
(54) Title: OPTICAL FIBRE FEED ARRANGEMENT



(57) Abstract: The present invention concerns a procedure and a system for feeding optical fibre cables into a pipeline with the help of an installation device at adjustable speed. In order to prevent damage during the advancement of the optical fibre cable the engine (15) of the installation device has been supplied with a friction safety clutch (17) exerting pressure on a moving coil (18, 23).

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Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO, SE, SI, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

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Optical fibre feed arrangement

TECHNICAL FIELD OF THE INVENTION

The present invention concerns a method to be used for feeding at adjustable speed of an optical fibre cable into a pipeline/duct, and an arrangement devised for adjustable feeding of an optical fibre cable into the same. The feeding arrangement and method are primarily intended to be used for installations of optical fibre cables in pipeline systems located outdoors or between residential units and a central unit, such as between several apartments in an apartment building and a central coupling unit located in the house's cellar or similar.

DESCRIPTION OF RELATED ART

It has been known for some time that optical fibres or optical fibre cables can be blown or sucked into pipelines/ducts, either by creating overpressure by means of compressed air supply so that the optical fibre or optical fibre cable is blown into the pipeline, or by creating under-pressure at the end of the pipeline/duct, so that the optical fibre or the optical fibre cable is sucked into it.

SUMMARY OF THE INVENTION

In order to simplify the handling of optical fibre cables in connection with their feed into pipelines/ducts and to ensure that they are not exposed to undesirable pressure during the feeding process, which could result in the bending or breaking of the cables during this process, a feeding device located in the feeding mechanism has been

supplied with a friction safety clutch which regulates the feed of the optical fibre cable when feed resistance increases. For additional regulation of the advancement of the optical fibre cable the feeding mechanism can be regulated by adjusting the air stream and/or the rotation speed of the feeding wheel. To further facilitate the operation of the feeding arrangement it has been designed as a hand-tool which needs to be connected to just one or more energy sources.

The invention is described below in more detail with the help of a proposed method of execution and with reference to the enclosed pages containing drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

Figures 1 - 3 show different views of the feeding device in accordance with the invention.

Figure 4 shows the feeding device in perspective.

Figure 5 shows the feeding device when disassembled.

Figures 4 and 5 provide details of how friction safety clutches can be arranged in relation to the feeding device.

DETAILED DESCRIPTION OF EMBODIMENTS

Figures 1 - 5 show how a feeding device can be constructed in accordance with the invention. The feeding

device consists of a handgrip unit 1 containing a battery 2 and of a feeding system for optical fibre cables. The feeding arrangement consists in turn of a lower part 3 and an upper part 4 connected with each other by a guide bar 5 which is further equipped with an adjustable positioning screw 6. With the help of the positioning screw 6 the distance between the upper part and the lower part can be regulated, so that the optical fibre cable can be placed correctly between the upper and the lower part when open, and when the two parts are brought together it will find itself in a groove 7 between the upper part and the lower part. The cross-section of the groove has been designed in such a way as to be able to hold a maximum of the cross-sectional area of the optical fibre cable. At the front of the upper and lower parts removable extension units 8, 9 of suitable material have been fastened, which form together a hollow space 10 of a circular cross-section, for example, into which the end of a pipeline/duct can be entered, and through which the optical fibre cable is fed. Adjacent to the removable extension units is a space 11 for compressed air to be supplied for feeding the optical fibre cable into the pipeline. The lower section of this space is connected to a compressor 12 by means of an adjustment screw 13 for regulation of the supply of compressed air. The lower section is further connected to a handgrip unit 1 which can be designed like a pistol-type handle, containing a trigger 14 for the regulation of the number of revolutions of the engine 15 pushing the optical fibre cable forward. In addition to the regulator of the rotational frequency the section

also contains a switch for changing the direction of the feed and a resetting device. The engine 15 is fastened to the lower part, and its driving axle 16 operates through a friction safety clutch 17 upon a moving coil 18. The engine can be either electrically driven or it may be powered by compressed air. Electric operation can be provided by means of a rechargeable battery in the battery component 2 fastened to the handgrip's lower part 1, or it may be connected to an external power supply via the rotational frequency regulator. When using the electric engine only, the optical fibre cable can be fed into the pipeline without any supply of compressed air to the extension units. When the engine is operated by compressed air, its compressor can be connected to the compressor used for the feeding of the optical fibre into the pipeline. The friction safety clutch 17 ensures controlled forward feed of the optical fibre cable due to the fact that at constant rotation of the engine and increased resistance felt by the optical fibre cable during its forward feed into the pipeline the moving coil will skid in the opposite direction to the driving axle, preventing the cable from being exposed to forces going in the opposite direction, which could result in the bending or breaking of the optical fibre cable in the feed area. By further providing the clutch with a possibility of regulation, a suitable safety level can be achieved for the forward feed of the optical fibre cable. Thanks to the flexibility provided by the friction safety clutch, the force of the forward motion of the optical fibre cable can be regulated, depending on the resistance encountered in the pipeline, and the forward feed of the cable can thus be optimised.

The friction safety clutch 17 may consist of two circular contact surfaces 19, 20 made of low-friction material, operating between the end of the driving axle 16 and the moving coil 18 made of metal, as well as between the said moving coil and an external plate (21), which is connected to the driving axle's end by means of adjustment screws 22 (see Figure 6). The contact surfaces can thus be pressed against the moving coil with controlled force. If the feed of the optical fibre cable is obstructed in the pipeline, the contact surfaces of the friction safety clutch will start skidding against the moving coil, impeding its movement, so that the cable will not be pushed forward at the risk of being damaged. The friction safety clutch 17 may also consist of a moving coil 23 made of low-friction material, operating between the driving axle's end 16 and an external, spring-loaded 24 plate 25 made of, for example, metal. The force exerted by the spring can be regulated by means of a screw 26 in order to attain a desirable degree of friction by the clutch, thus preventing damage of the optical fibre cable during its forward feed into the pipeline.

The upper part contains further a spool holding device 27, 28 with a spool support 29 on which a spool with an optical fibre cable can be fastened. The holding device for the spool arm has been designed in such a way that the position of the spool arm can be adjusted as desired. The upper part contains also a revolution counter 30. With the help of the rev. counter the number of revolutions may be counted, or the length of

the optical fibre cable fed into the pipeline measured by means of a measuring wheel 31 which is turned by the running optical fibre cable being fed into the pipeline. The measuring wheel can be spring-loaded, so that the pressure of the optical fibre cable which is being fed into the pipeline can be regulated, which helps to ensure that the cable advances correctly. The measuring wheel should preferably be made conspicuous and contain some sort of marking, so that the wheel's rotations can be observed, which is of great use to the user of the installation device. This can be done by providing a transparent lock 32 for the measuring wheel, ensuring its protection and visibility of its rotations. The user will thus be able to see whether the measuring wheel is rotating or not during the forward feed of the optical fibre cable by the moving coil, which is why it is a good idea to provide also the moving coil with some visible marking so that its rotations can be observed. This can be done by supplying a transparent lock 33 for the moving coil so that it can be protected and visible.

The installation device may either be held by hand or it may be placed on a tripod. A roll of optical fibre cable is placed on the spool arm and one end of the cable is introduced into the groove space between the upper and the lower part. To regulate the distance between the upper and the lower part a positioning screw is used for the raising or lowering of the upper part in relation to the lower part. When the two parts are brought together the measuring wheel will press the optical fibre towards the moving coil with the help of the spring. The optical

fibre cable is further led through the interacting removable extension units, and its one end is stuck into a pipeline which has been placed in the extension units. When the engine is started and compressed air is supplied, the optical fibre cable will be fed into the pipeline. Depending on the feed requirements the positioning screws are adjusted in a suitable way, and an operator may monitor the feed.

When a tripod is used, the installation device can be manoeuvred from a distance with a remote control 34. Once suitable air supply and a desirable degree of friction has been ensured with the help of the adjustment screws, the installation device placed on a tripod may easily be manoeuvred by means of the remote control, and the operator has more time to watch over and regulate the forward feed of the cables. The invention is, naturally, not limited to the above-described method of execution illustrated in the drawings, and can be modified within the framework of the attached patent claims.

CLAIMS

1. Method for feeding an optical fibre cable into a pipeline with the help of an installation device at adjustable speed is c h a r a c t e r i s e d by the fact that the engine's operation of a moving coil for the forward feed of the optical fibre cable in the feeding device is regulated by a friction safety clutch, in which the optical fibre cable's forward feed by means of the moving coil can be impeded if resistance in the pipeline increases, and damage of the cable can be prevented.
2. Method under Patent Claim 1 is c h a r a c t e r i s e d by the fact that the operation of the friction safety clutch can be regulated in order to adjust it to the optical fibre cable used and fed into the pipeline, and to the pipeline used, in order to prevent the cable's damage.
3. Method under Patent Claim 1 is c h a r a c t e r i s e d by the fact that the supply of compressed air to the installation device for the forward feed of the optical fibre cable can be regulated in such a way as to prevent the cable's damage.
4. Arrangement in which an installation device with adjustable speed is used in order to feed an optical fibre cable into a pipeline is c h a r a c t e r i s e d by the fact that the engine provided for the feeding of an optical fibre cable into the feeding device has been equipped with a

friction safety clutch 17 for controlled motion of a moving coil 18, 23 which can impede the forward movement of the optical fibre cable.

5. Arrangement under Patent Claim 4 is c h a r a c t e r i s e d by the fact that the operation of the friction safety clutch can be controlled and regulated by pressing the contact surfaces 19, 20, with the help of adjustment screws 22, against the moving coil 18 in order to impede its motion and stop the advancement of the optical fibre cable altogether if the progress of the cable in the pipeline has been obstructed.

6. Arrangement under Patent Claim 5 is c h a r a c t e r i s e d by the fact that the contact surfaces 19, 20 are made of low-friction material and have been devised to operate on both sides of the moving coil 18.

7. Arrangement under Patent Claim 4 is c h a r a c t e r i s e d by the fact that the operation of the friction safety clutch is controlled with the help of an adjustment screw (26) which regulates the spring power of a spring 24 operating on a plate 25 which presses against the moving coil 23 and impedes the motion of the moving coil, stopping the advancement of the optical fibre cable altogether if the progress of the cable in the pipeline has been obstructed.

8. Arrangement under Patent Claim 7 is c h a r a c t e r i s e d by the fact that the moving coil 23 is made of low-friction material and the plate 25 has been designed in such a way that it presses the moving coil against the end of the driving

axle (16).

9. Arrangement under Patent Claim 4 is c h a r a c t e r i s e d by the fact that the engine (15) is electrically driven.

10. Arrangement under Patent Claim 4 is c h a r a c t e r i s e d by the fact that the engine 15 is air-operated.

11. Arrangement under Patent Claim 4 is c h a r a c t e r i s e d by the fact that the installation device is supplied with compressed air through a hollow space 10 so that the pipeline can be connected to the installation device and the optical fibre cable fed into the pipeline.

12. Arrangement under Patent Claim 11 is c h a r a c t e r i s e d by the fact that compressed air supplied for the advancement of the optical fibre cable can be regulated by, for example, an adjustment screw 12.

13. Arrangement under Patent Claim 4 is c h a r a c t e r i s e d by the fact that a revolution counter 30 is connected to a measuring wheel (31) which runs along the optical fibre cable, registering the length of the cable which has been fed into the pipeline.

14. System under Patent Claim 13 is c h a r a c t e r i s e d by the fact that the measuring wheel 31 is spring-loaded and can regulate the pressure exerted on the optical fibre cable fed into the pipeline.

15. Arrangement under any of Patent Claims 4 - 14 is c h a r a c t e r i s e d by the fact that the installation device has been supplied with a remote

control 34 which can be operated from a distance.

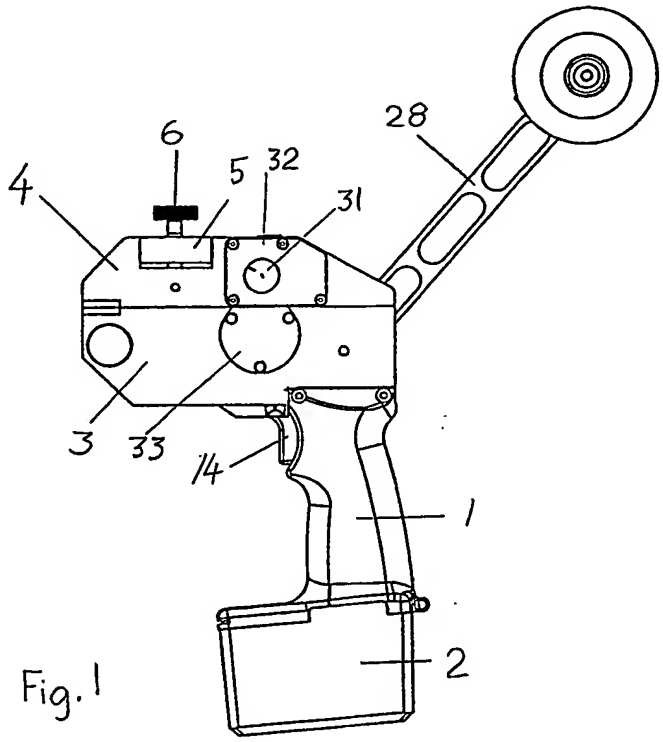

Fig. 1

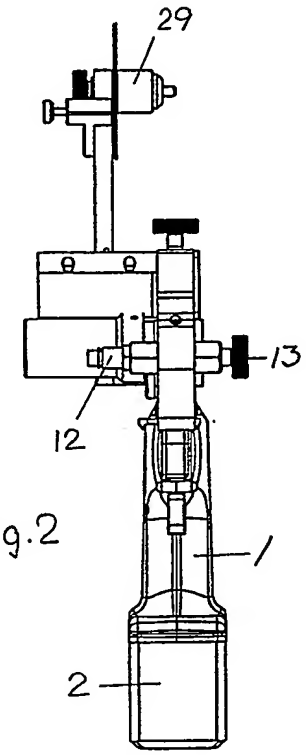

Fig. 2

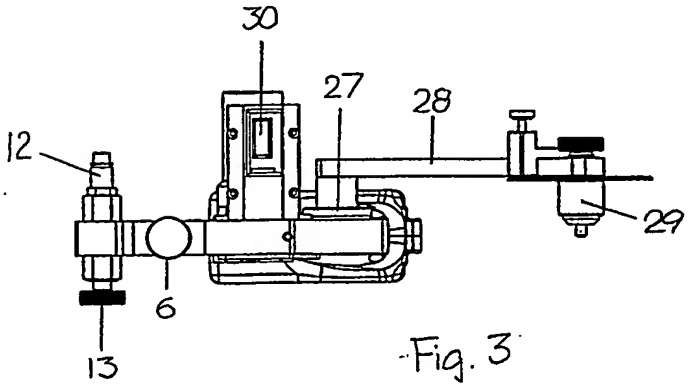

Fig. 3

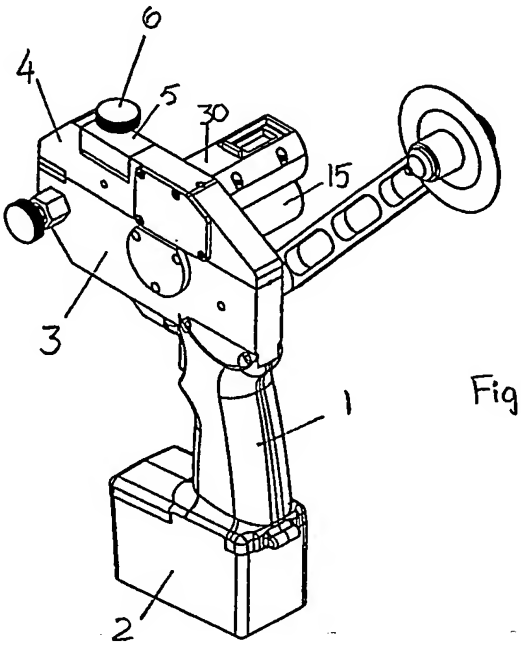

Fig. 4

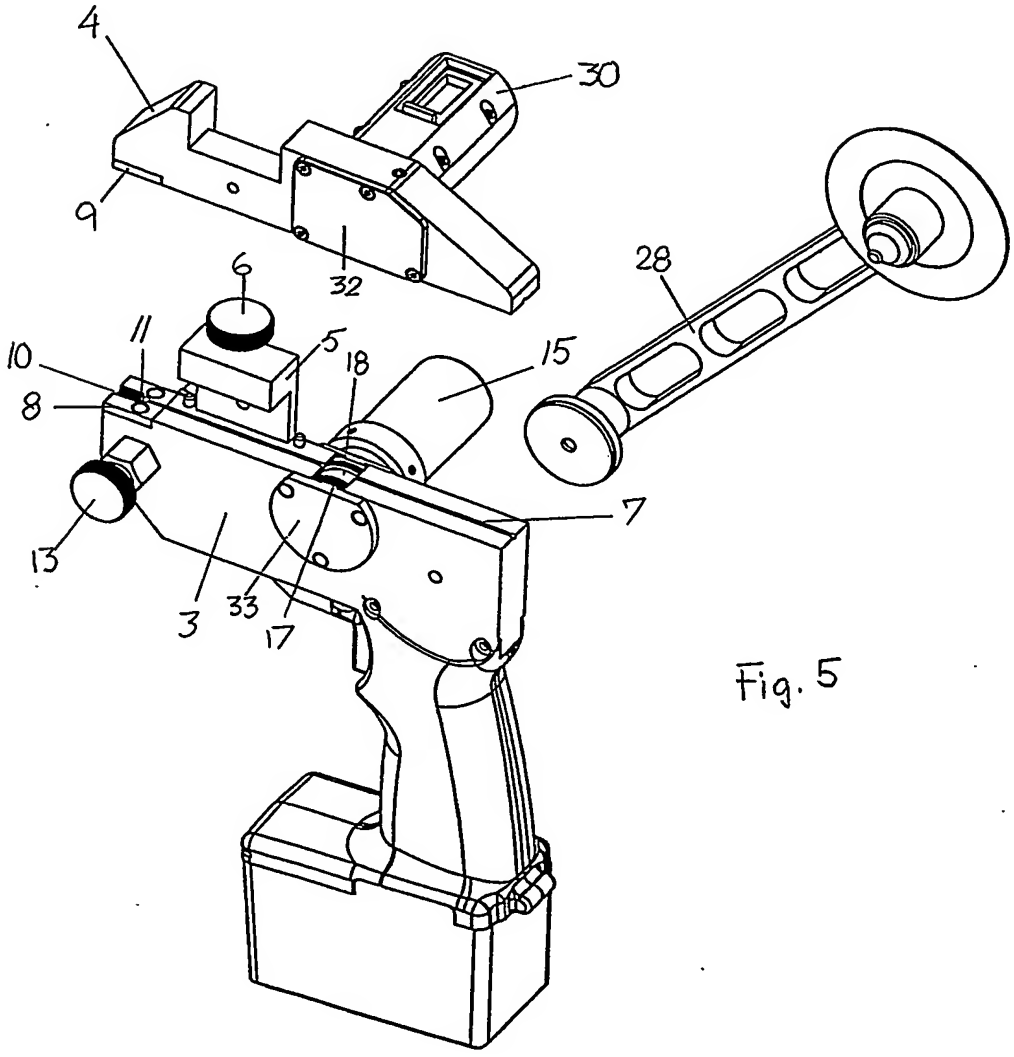

Fig. 5

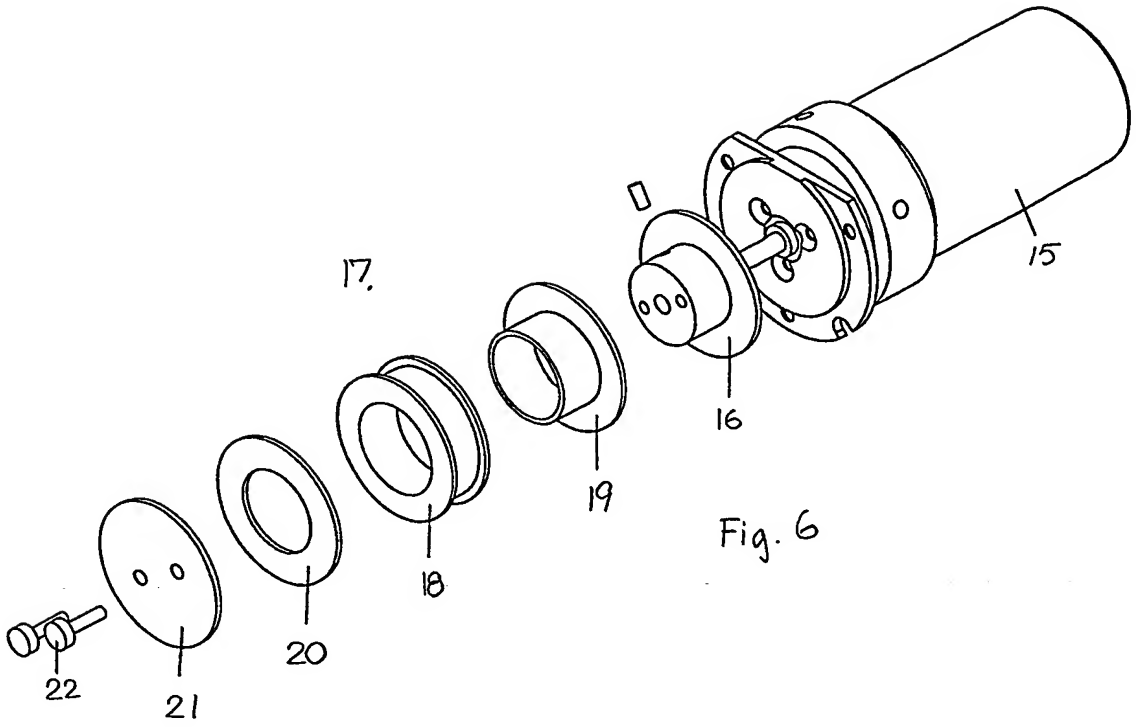

Fig. 6

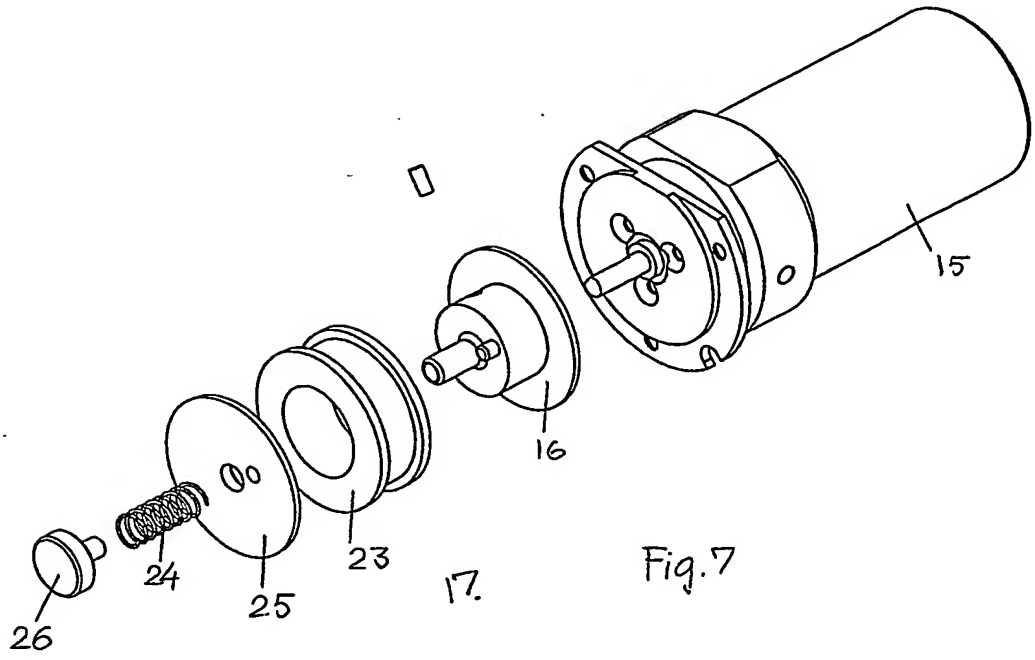

Fig. 7

International application No.
PCT/SE 03/00368

A. CLASSIFICATION OF SUBJECT MATTER

IPC7: G02B 6/54
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7: G02B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-INTERNAL, WPI DATA, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 9934492 A1 (PLUMETTAZ S.A.), 8 July 1999 (08.07.99), page 8, line 14 - line 21; page 9, line 13 - line 20; page 11, line 10 - line 20, abstract, figures ---	1-15
X	US 4372535 A (D.W. GIBSON ET AL), 8 February 1983 (08.02.83), column 2, line 8 - column 4, line 22, figure --- --------	1,2,4-10, 13-15

☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
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"P" document published prior to the international filing date but later than the priority date claimed
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Date of the actual completion of the international search	Date of mailing of the international search report
2 June 2003	06 -06- 2003
Name and mailing address of the ISA/ Swedish Patent Office Box 5055, S-102 42 STOCKHOLM Facsimile No. +46 8 666 02 86	Authorized officer Magnus Westöö / MN Telephone No. +46 8 782 25 00

Form PCT/ISA/210 (second sheet) (July 1998)

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WO 9934492 A1	08/07/99	CN 1285970 T	28/02/01
		EP 1040543 A	04/10/00
		FR 2774777 A,B	13/08/99
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